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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/680,204	10/08/2003	Junichi Ito	Q77816	5287

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EXAMINER	
MAYES, MELVIN C	
ART UNIT	PAPER NUMBER
1734	

DATE MAILED: 05/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.** 10/680,204	**Applicant(s)** ITO ET AL.	
	Examiner Melvin Curtis Mayes	**Art Unit** 1734	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 February 2005*.
2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-8* is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) *1-3 and 5-8* is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☐ All b)☐ Some * c)☐ None of:
1.☐ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

HC

DETAILED ACTION

Claim Rejections - 35 USC § 103

(1)

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

(2)

Claims 1-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Figueroa et al. 2002/0085334 in view of the admitted prior art and JP 03-241890 Patent Abstract, further in view of either EP 1 122 006 or EP 1 127 638.

Figueroa et al. disclose a method of making a capacitor comprising: screen printing ceramic layers with conductive layers (internal electrodes); stacking the layers to form a structure; forming via holes 1006 through all the ceramic layers and every other conductive layer of the structure by laser drilling; depositing conductive via material of metal and glass frit paste in the via holes to connect to the conductive layers; and cofiring. Figueroa et al. disclose that the ceramic layers can be barium titanate and the conductive layers (internal electrodes) can be of thick film of nickel or copper [0057]-[0065]. Figueroa do not disclose that the metal in the paste has an average particles size of 2 μm or less.

The admitted prior art teaches that in using laser to form through holes through ceramic sheets and internal electrodes, when the internal electrode layer has a melting point lower than that of the ceramic sheets, the surface of an end of the internal electrode retracts from the wall which defines the through hole [0004].

JP 03-241890 Patent Abstract teaches that paste can be accurately and densely filled in an easy and efficient filling operation in through-holes in a stack of green sheets by placing the stack of green sheets on a paste tank 21 filled with paste, placing a pressing plate 28 on the stack and pressing the plate and paste in the tank at the same pressure to fill the through-holes. The paste used has a viscosity of at least $50X10^4$ cps (500 Pa·s).

EP 1 122 006 teaches that nickel conductive paste for making a multilayer ceramic capacitor and which can control heat shrinkage while inhibiting the occurrence of any rapid oxidation comprises nickel powder having average particle size of not more than 1 μm and is constituted of nickel powder, resin, solvent and may comprise glass frit [0001]-[0007], [0021].

EP 1 127 638 teaches that nickel conductive paste which is highly dispersable in an organic vehicle and of low agglomerate properties for making a ceramic capacitor comprises nickel powder of average particle size of 0.1-1 μm in a paste of resin, solvent and glass frit if necessary [009]-[0012], [0042].

It would have been obvious to one of ordinary skill in the art to have modified the method of Figueroa et al. for making a capacitor by filling the via holes with paste by placing the stack on a paste-filled paste tank (filler-charged charging container) and placing a pressing plate on the stack and applying pressure to the tank and pressing plate, as taught by JP '890 Patent Abstract, as an easy and efficient filling operation for accurately and densely filling through-holes in a green sheet stack with paste.

By comprising the internal conductive layers (internal electrodes) of either nickel (melting point 1455°C) or copper (melting point 1085°C) and the ceramic layers of barium titanate (melting point >1600°C) and laser drilling a via hole through the conductive layers and ceramic layers, as disclosed by Figueroa et al, the via hole is defined by a wall and internal electrode layer having an end portion spaced apart from the wall as claimed, as nickel or copper has a melting point lower than barium titanate and the admitted prior art teaches when a laser is used to form through holes through ceramic sheets and internal electrodes and the internal electrode layer has a melting point lower than that of the ceramic sheets, the surface of an end of the internal electrode retracts from the wall which defines the through hole. Applying sufficient pressure to the tank of paste to densely fill the via hole and reach the end of the conductive layers (internal electrodes) would have been obvious to one of ordinary skill in the art to connect the paste to the conductive layers (internal electrodes), as disclosed by Figueroa et al.

It would have been obvious to one of ordinary skill in the art to have further modified the method of Figueroa et al. for making a capacitor by filling the via holes with conductive paste of nickel having an average particle size of less than 1 μm, as taught by EP 1 122 006, to provide a nickel conductive paste which can control heat shrinkage while inhibiting the occurrence of any rapid oxidation, or, as taught by EP 1 127 638, to provide a nickel conductive paste which is highly dispersable in an organic vehicle and of low agglomerate properties. The use of a paste having nickel powder of average particle size less than 1 μm for forming the thick film internal electrodes and for filling the via holes would have been obvious to one of ordinary skill in the art for the advantages as taught by either EP '006 or EP '638.

It would have been obvious to one of ordinary skill in the art to have provided the paste of viscosity of at least 500 Pa·s, within the range of 100-20,000 Pa·s as claimed in Claim 5, as JP '890 Patent Abstract discloses that the paste used for filling by pressure from a tank has a viscosity of at least 500 Pa·s. Applying pressure to the paste and the pressure plate in the range as claimed in Claim 3 would have been obvious to one of ordinary skill in the art to provide sufficient pressure to fill via holes as disclosed by Figueroa et al. with paste of viscosity as taught by JP '890 Patent Abstract.

(3)

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claim 1 above, and further in view of Ahiko et al. 6,407,907

Ahiko et al. teach that in a multilayer ceramic capacitor having nickel through hole electrodes connected to nickel internal electrodes, the number of through holes required to make the ESR (equivalent serial inductance) 1 mΩ or less depends on the thickness of the capacitor and the diameter of the through holes. For a capacitor of 0.5 mm thickness, through holes of diameter of 100 μm or less can be used if at least 24 through hole electrodes are provided (col. 8, lines 1-54).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by providing the via hole electrodes with aspect ratio within the range of 4 to 25, as taught by Ahiko et al. as dependent on the thickness of the capacitor, diameter of the via hole electrodes and number of via hole electrodes in order to make the ESR (equivalent serial inductance) 1 mΩ or less. Ahiko et al. teach that for a ceramic multilayer capacitor of thickness of 0.5 mm (500 μm), via hole electrodes of diameter of 100 μm or less can be used, and thus suggest that via hole electrodes of aspect ratio (length to diameter) of at least 5 can be used in a multilayer ceramic capacitor, the number of such via hole electrodes provided in order to make ESR 1 mΩ or less.

Response to Arguments

(4)

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection, applied because of the amendment to Claim 1.

Conclusion

(5)

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

(6)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 571-272-1234. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Fiorilla can be reached on 571-272-1187. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Melvin Curtis Mayes
Primary Examiner
Art Unit 1734

MCM
May 26, 2005